AD-A215 159

Form Approved
OMB No. 0704-0188

average 1 hour per response, including the time for reviewing instructions, searching existing data sources,
ng the collection of information. Send comments regarding this burden estimate or any other aspect of this
to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson
, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

| 1. AGENCY USE ONLY (Leave blank) | 2. REPORT DATE | 3. REPORT TYPE AND DATES COVERED |
| | Oct 83 | Final (Oct 01, 82-Sep 30, 83 |

4. TITLE AND SUBTITLE	5. FUNDING NUMBERS
"RESEARCH ON THE INVERSE PROBLEM OF SCATTERING"	61102F
	2304/A4

6. AUTHOR(S)

Harry E. Moses

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)	8. PERFORMING ORGANIZATION REPORT NUMBER
University of Lowell	
Center for Atmospheric Research	
450 Aiken Street	AFOSR-TR 89-1474
Lowell MA 01854	

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSORING/MONITORING AGENCY REPORT NUMBER
AFOSR	
BLDG 410	
BAFB DC 20332-6448	AFOSR-81-0253

11. SUPPLEMENTARY NOTES

| 12a. DISTRIBUTION/AVAILABILITY STATEMENT | 12b. DISTRIBUTION CODE |
| | |

13. ABSTRACT (Maximum 200 words)

The activities done under the grant for the fiscal year 1983 are summarized.
Topics of investigation included th Kalman filter equation and the phase retrieval
problem.

DTIC
ELECTE
DEC 05 1989
S
E
D

14. SUBJECT TERMS	15. NUMBER OF PAGES
	5
	16. PRICE CODE

| 17. SECURITY CLASSIFICATION OF REPORT | 18. SECURITY CLASSIFICATION OF THIS PAGE | 19. SECURITY CLASSIFICATION OF ABSTRACT | 20. LIMITATION OF ABSTRACT |
| unclassified | unclassified | | |

NSN 7540-01-280-5500

Standard Form 298 (890104 Draft)
Prescribed by ANSI Std. 239-18
298-01

89 11 22 029

AFOSR-

RESEARCH ON THE INVERSE PROBLEM OF SCATTERING

Harry E. Moses

University of Lowell
Center for Atmospheric Research
450 Aiken Street
Lowell, Massachusetts   01854

Accession For

NTIS GRA&I	X
DTIC TAB	
Unannounced	☐
Justification	

By_____
Distribution/
Availability Codes

Dist	Avail and/or Special
A-1	

QUALITY INSPECTED 1

October 1983

AIR FORCE OFFICE OF SCIENTIFIC RESEARCH
DIRECTORATE OF MATHEMATICAL AND INFORMATION SCIENCES
BOLLING AIR FORCE BASE
WASHINGTON, D. C.   20332

TABLE OF CONTENTS

1.0 RESEARCH DIRECTIONS

In addition to continuing the directions indicated in the previous annual report, we have gone back to our interest in the linear filter. As indicated in earlier reports this equation, sometimes called the Kalman filter equation, is identical to the Gelfand-Levitan equation of inverse scattering theory. We have shown how the filter equation can be solved in terms of a comparison filter and given group-like relations between filters. A paper reporting the results has been accepted for publication.

A second area of interest is the phase retrieval problem. The solution of this problem is important in imaging problems associated with speckle interferometry, tomography and other areas. We have obtained a much simpler algorithm than used heretofore. Moreover, unlike most previous algorithms can be extended readily to two dimensions. The results of this research will also appear as a publication.

2.0 INTERACTIONS WITH OTHER SCIENTISTS

The author has continued his collaboration with
Prof. J. M. Cohen of the University of Pennsylvania and Prof.
R. T. Prosser of Dartmouth College. He has also given in-
vited papers at the Spring Meeting of the SPIE in Washington
and at a NATO inverse seminar in Germany in September 1983.
He has continued to attend and participate in a seminar at
Massachusetts Institute of Technology.

3.0 PUBLICATIONS AND PAPERS WHICH HAVE BEEN ACCEPTED FOR PUBLICATION

1. "Example of Two Distinct Potentials Without Point Eigenvalues Which Have the Scattering Operator With the Reflection Coefficient $c(0) = -1$," Phys. Rev. A 27, 2220 (1983).

2. "Parity-Dependent Potentials for the One-Dimensional Schroedinger Equation Obtained From Inverse Spectral Theory" (with P. B. Abraham and B. DeFacio), J. Phys. A, 16, 303 (1983).

3. "The Gelfand-Levitan Equation on the Finite Interval" (with R. T. Prosser), J. Math. Phys., 24, 2146 (1983).

4. "Conditions for the Uniqueness of Phases and Correlation Functions in Wave Propagation," Proceedings of SPIE, Vol. 413, Inverse Optics, A. J. Devaney, Editor (1983).

5. "The Use of Comparison Filters in Linear Filter Theory," J. Math. Phys. (in press).

6. "Phases of Complex Functions from the Amplitudes of the Functions and the Amplitudes of the Fourier and Mellin Transforms" (with R. T. Prosser), J. Opt. Soc. Am. (in press).

7. "A Solution of the Time-Dependent Inverse Source Problem for Three-Dimensional Electromagnetic Wave Propagation," Proceedings NATO-Advance Research Workshop on Inverse Methods of Electromagnetic Imaging held at Bad Windsheim, Germany, September 18-24 (1983).

8. "Eigenvalues and Eigenfunctions Associated with the Gelfand-Levitan Equation" (with R. T. Prosser), J. Math. Phys. (in press).